REMARKS

Claims 1-25 remain in the application and stand rejected. Reconsideration of the rejection is respectfully requested in light of the following reasons.

Claim Rejections -- 35 U.S.C. § 102 (Bucker)

Claims 1-4, 9-11, 14-16, 18, and 21-25 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Bucker ("Bucker"). The rejection is respectfully traversed.

Claim 1 recites an ink pattern comprising an ink that is substantially devoid of particles that can scratch a surface of a first layer that is etched using the ink pattern as a mask. Claim 2, which depends on claim 1, recites that the ink is substantially devoid of silicon dioxide.

The last office action rejects claims 1 and 2 based on Bucker's masking layer 16. FIG. 1 of Bucker is reproduced below for ease of discussion.

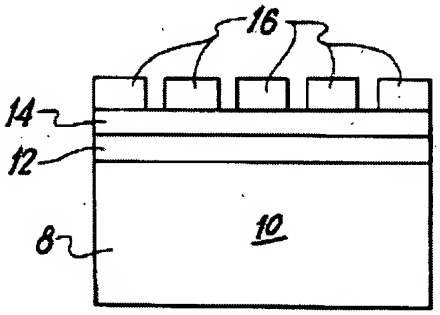

FIG. 1

Bucker pertains to adhesion of nickel on a tin oxide surface (Bucker Abstract and Summary of the Invention). In Bucker, a solar cell 10 includes a tin-oxide layer 12. A material 14 is spin coated on top of the tin-oxide layer 12 to protect the tin-oxide layer 12 during plating of electrodes thereto (Bucker, col. 2, lines 9-19). Masking layer 16 is used as a mask in the etching of the material 14 to form the electrode pattern (Bucker, col. 2, lines 33-39).

Bucker discloses masking layer 16 as a silk-screened asphalt-based ink (Bucker, col. 2, lines 35-37). The last office action takes the position that masking layer 16 is "devoid of silicon dioxide as it is asphalt based and would not scratch the layer beneath the ink." Applicants respectfully disagree with this conclusion. Other than disclosing that the masking layer 16 is asphalt-based, Bucker does not disclose the rest of the composition of the masking layer 16. That is, Bucker discloses that masking layer 16 includes asphalt, not that masking layer 16 consists entirely of asphalt. It is respectfully submitted that there is no information in Bucker or the last office action to support the conclusion that masking layer 16 is free of silicon dioxide or would not scratch the material 14 just because it is asphalt-based.

It is thus respectfully submitted that claims 1 and 2 are patentable over Bucker.

Claims 3 and 4 depend on claim 1 and are thus patentable over Bucker at least for the same reasons that claim 1 is patentable.

Claim 9 is patentable over Bucker at least for reciting: "the ink pattern comprising an ink that is substantially free of particles that can scratch a surface of the oxide layer." Claim 10 recites that the ink is substantially free of silicon dioxide. The last office action takes the position that the masking layer 16 is "devoid of silicon dioxide as it is asphalt based and would not scratch the layer beneath the ink." As explained above, it is respectfully submitted that asphalt-based does not necessarily mean devoid of silicon dioxide or absence of material that would scratch the material 14, which the last office action reads as the oxide layer. Therefore, it is respectfully submitted that claims 9 and 10 are patentable over Bucker.

Claim 11 is patentable over Bucker at least for reciting: "wherein the oxide layer comprises thermally grown oxide." It is respectfully submitted that "thermally grown oxide" is a well accepted term of art in semiconductor processing. Here, Bucker is explicit that material 14 is spin-coated, rather than thermally grown (Bucker, col. 2, lines 15-20, 27-32). It is respectfully submitted that heating of the material 14 densifies, not grow, the material 14 (Bucker, col. 2, lines 27-28). That is, the material 14 is not thermally grown as required by claim 11.

Claim 14 is patentable over Bucker at least for reciting: "the ink pattern comprising an ink that is substantially devoid of particles that can scratch a surface of the first layer." Claim 15 recites that the ink is substantially devoid of silicon dioxide particles. The last office action takes the position that the masking layer 16 is "devoid of silicon dioxide as it is asphalt based and would not scratch the layer beneath the ink." As explained above, it is respectfully submitted that asphalt-based does not necessarily mean devoid of silicon dioxide or absence of material that would scratch the material 14, which the last office action reads as the oxide layer. Therefore, it is respectfully submitted that claims 14 and 15 are patentable over Bucker.

Claims 16 and 18 depend on claim 14 and are thus patentable over Bucker at least for the same reasons that claim 14 is patentable.

Claim 21 is patentable over Bucker at least for reciting: "the ink pattern comprising an ink that is substantially devoid of particles that can scratch a surface of the layer." As explained above, it is respectfully submitted that asphalt-based does not necessarily mean devoid of silicon dioxide or absence of material that would scratch the material 14. Therefore, it is respectfully submitted that claim 21 is patentable over Bucker.

Claims 22-25 depend on claim 21 and are thus patentable over Bucker at least for the same reasons that claim 21 is patentable.

Claim Rejections -- 35 U.S.C. § 103 (Bucker and Matushiita)

Claims 5, 7, 8, 12, 17, and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bucker as applied to claims 1-4, 9-11, 14-16, 18, and 21-25 and further in view of U.S. Patent Publication No. 2002/0000242 by Matushiita et al. ("Matushiita"). The rejection is respectfully traversed.

Claim 5 is patentable over the combination of Bucker and Matushiita for reciting: "wherein the etching of the first layer exposes a silicon material." As explained in the Specification:

> "In the example of FIG. 2B, particle-free ink 110 is substantially devoid of silicon dioxide particles to prevent scratching of underlying oxide layer 213. The inventors found that etchants of a subsequently performed silicon etch may penetrate these scratches and form pits on the surface of oxide layer 213. "
>
> (Specification, page 5, lines 18-20)

That is, the inventors found that etchants for silicon may damage an oxide layer, resulting in pits in the oxide layer that may damage the solar cell (Specification, page 4, lines 17-20; page 6, lines 13-16). The use of particle-free inks is thus especially beneficial in preventing the oxide pit problem in processes having subsequent silicon etch step.

As noted in the last office action, Bucker does not disclose etching through to the silicon layer underneath the tin-oxide layer 12. However, the last office action suggests that it would have been obvious "to etch down to the silicon material as in Matushiita in the method of Bucker because this allows contacts to be formed with the silicon layer." Applicants respectfully disagree with this conclusion to the extent the proposed combination would make Bucker's device unfit for its intended purpose, would change the primary principle of operation of Bucker, and does not have a reasonable expectation of success.

As shown in Bucker FIG. 3, the nickel layer 18 electrically connects to the silicon bulk 10 by way of the tin-oxide layer 12. The nickel layer 18 does not directly connect to the silicon bulk 10 by design. The gist of Bucker's disclosure is how to adhere nickel 18 to the surface of the tin-oxide surface 12 (Bucker Abstract, Background of the Invention). That is, Bucker is concerned with using the tin-oxide layer 12 as a transparent window to lower production cost and to allow transmission of solar radiation to the substrate with little or no attenuation.

The proposed combination necessarily requires etching through the tin-oxide layer 12 to directly connect to the silicon bulk 10, thus making the tin-oxide layer 12 unnecessary and the teaching of adhering the nickel layer 18 to the tin-oxide layer 12 unnecessary. In turn, the use of the material 14 that specifically protects the tin-oxide layer 12 is also unnecessary. It is also not clear how nickel layer 18 can be connected

directly to the silicon bulk 10 without attaching to the tin-oxide layer 12, as Bucker primarily teaches attaching the nickel layer 18 to the tin-oxide layer 12.

Furthermore, the proposed motivation of allowing contacts to be formed with the silicon layer is suspect as Bucker already allows contacts to be formed with the silicon layer by way of the tin-oxide layer 12. There is no reason for the proposed combination especially when considering that a nickel/tin-oxide contact structure as in Bucker supposedly allows for reduced production cost and permits transmission of solar radiation to the substrate with little or no attenuation (Bucker, col. 1, lines 6-24).

Therefore, it is respectfully submitted that claim 5 is patentable over the combination of Bucker and Matushiita.

Similarly, claims 7, 8, 12, 17, and 19 recite etching of the silicon material, which as explained is not proper in Bucker because the electrical connection to the silicon bulk 10 is by way of the tin-oxide layer 12 being used as a transparent window. That both Matushiita and Bucker involve solar cell fabrication does not necessarily mean the combination has a reasonable expectation of success, especially here where Bucker has a process involving the use of a transparent window to electrically connect to the silicon bulk and Matushiita does not. That is, even though they both pertain to solar cell fabrication, Matushiita and Bucker disclose very different processes for fabricating solar cells.

Therefore, it is respectfully submitted that claims 7, 8, 12, 17, and 19 are patentable over the combination of Bucker and Matushiita.

Claim Rejections -- 35 U.S.C. § 103 (Bucker and Dill)

Claims 6, 13, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bucker as applied to claims 1-4, 9-11, 14-16, 18, and 21-25 and further in view of U.S. Patent No. 4,838,952 to Dill et al. ("Dill"). The rejection is respectfully traversed.

As noted in the last office action, Bucker does not disclose a back-side contact solar cell. However, the last office action suggests that Dill does and it would have been obvious "to etch a backside-contact solar cell as in Dill in the method of Bucker because backside-contact solar cells can have a smooth front surface and therefore a non-scattering solar cell results." Applicants respectfully disagree with this conclusion.

As explained above, Bucker involves the use of a transparent window comprising a tin-oxide layer. Bucker teaches adhering a nickel layer on the surface of the tin-oxide layer to electrically connect to the silicon bulk. It is respectfully submitted that Bucker's disclosure is not compatible with the back-side contact solar cell of Dill because Bucker's transparent window provides the electrical connection to the silicon. On the other hand, in Dill, holes are drilled through the bulk to connect to the emitter layer. Bucker's transparent window prevents formation of these holes. Dill FIG. 2 is reproduced below for ease of discussion.

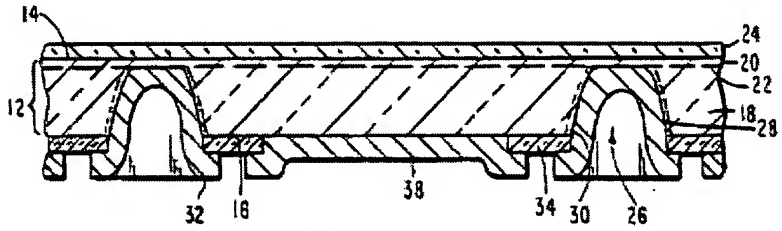

Fig. 2.

In Dill, openings 26 are drilled through the body 12 to allow contact lines 32 to electrically connect to the emitter layer 20 (Dill, col. 3, lines 6-10). This connection to the emitter layer 20 to allow for contact to the emitter layer 20 from the back-side is not compatible with Bucker's process because Bucker's tin-oxide layer 12 would be in the way. That is, the openings 26 are incompatible with the use of a transparent window that provides a surface for attaching a nickel interconnect; the transparent window would only be in the way. Without the transparent window, there would be no need for Bucker's material 14 that protects the transparent window, and the layer 16 used as a mask in the etching of the material 14. The proposed combination thus requires a major redesign of Bucker in a way that makes Bucker unfit for its intended purpose. The proposed combination also changes the principle operation of Bucker and disregards the gist of its

disclosure, as well as not having a reasonable expectation of success as neither Bucker nor Dill teaches how to implement the proposed modification.

It is thus respectfully submitted that claims 6, 13, and 20 are patentable over the combination of Bucker and Dill.

Conclusion

For at least the above reasons, it is believed that claims 1-25 are in condition for allowance. The Examiner is invited to telephone the undersigned at (408)436-2112 for any questions.

If for any reason an insufficient fee has been paid, the Commissioner is hereby authorized to charge the insufficiency to Deposit Account No. 50-2427.

Respectfully submitted,
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Dated: May 10, 2007

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